



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/722,485	11/28/2000	Masaki Narushima	200246US2	5554
22850	7590	03/29/2004	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			ZERVIGON, RUDY	
			ART UNIT	PAPER NUMBER
			1763	
DATE MAILED: 03/29/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/722,485

Applicant(s)

NARUSHIMA, MASAKI

Examiner

Rudy Zervigon

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-6,9-13,17-22,26-28,30-32,36-44 and 51-69 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-6,9-13,17-22,26-28,30-32,36-44 and 51-69 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 28, 2003 has been entered.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 10, 12, 18, 31, 36-39, 43, 44, and 64-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652) in view of Gilchrist, Robin et al (US 5,846,375 A). Logan et al teaches a ceramic heater system comprising an upper heater base (124, Figure 3) partly, not integrally¹, formed of a ceramic material (column 3, lines 34-45; column 5, lines 26-32); and a lower heater base (130, Figure 3) formed of a ceramic material (column 3, lines 45-60; column 5, lines 26-32), the upper and lower heater bases forming a one-body heater base ("conducting electrical energy"; column 3, lines 46-53), with a lower surface of the upper heater base being in tight contact with the lower heater base once the components of the electrostatic chuck assembly (120) are assembled, the heater base (120, Figure 3 once assembled) including:

Art Unit: 1763

a mounting surface (122; Figure 3; column 2, lines 54-60 – boron nitride “isolation layer”, column 3, lines 5-10) which is formed as an upper surface of the upper heater base (124, Figure 3 once assembled) and on which an object (“semiconductor wafer under process (not shown)”) is mounted.

a metal (column 2, lines 58-63) heater (134 – column 3, lines 40-43; “heating layer”, column 3, lines 46-53), buried in the upper heater base (124; Figure 3), for heating the object (column 3, lines 32-45),

a helium fluid passage (150; column 5, lines 15-25) provided in the lower surface of the lower heater base (130, Figure 3; column 5, lines 1-5) and formed as a groove through which a fluid is supplied toward the mounting surface,

wherein the heater base is cooled by causing a fluid (column 3, lines 59-65; column 4, lines 1-13) whose temperature is lower than a temperature of the lower heater base (column 4, lines 1-13) to be supplied through the fluid passage.

Logan further teaches a ceramic (column 4, lines 41-48) heater system (Figure 1) comprising: a ceramic heater base (120, Figure 3; column 3, lines 32-53) formed of a ceramic material (column 4, lines 41-48). The heater base including a object (“product wafer (not shown)”; column 4, line 1) mounting surface formed on an upper surface (122, Figure 3) thereof; a heater winding (134, “heating pattern” Figure 3; column 3, lines 30-50), buried (column 4, lines 28-49) in the heater base for heating an object; and a fluid passage (150, Figure 3; column 3, lines 59-65) provided in the heater base (after bonding – column 4, lines 28-49) below the heater, whereby the heater base is cooled by causing a fluid (column 3, lines 59-65; column 4, lines 1-13) whose temperature is

¹ Integral – 3: lacking nothing essential: ENTIRE – integrality , integrally. Merriam-Webster’s

Art Unit: 1763

lower than a temperature of the heater base (column 4, lines 1-13) to be supplied through the fluid passage.

10. The ceramic heater system (120, Figure 3) according to claim 1, wherein the heater (134, Figure 3; column 3, lines 30-50) is formed of graphite (column 3, line 38) shaped in such a pattern as to evenly generate heat in the heater base.

12. The ceramic heater system (120, Figure 3) according to claim 1, further comprising: an electrode (126, Figure 3) buried in the heater base and located between the heater (134) and the mounting surface (122; column 2, lines 54-57); and a DC power (column 2, line 65 – column 3, line 5) supply for applying a DC voltage to the electrode; whereby applying the DC voltage to the electrode causes the object mounted on the mounting surface to be electrostatically chucked.

Logan further teaches that the fluid passage has a fluid inlet and a fluid outlet (not shown, Figure 1) formed in a lower surface (140) of the lower heater base (130, column 3, lines 62-68) – “circulating a cooling fluid” requires an entrance and exit connected to a pump.

Logan does not teach a fluid passage provided in the lower surface of the upper heater base. Logan does not teach that the heater base is monolithically formed of a ceramic material. In particular the only components that are not made of boron nitride (ceramic material) are the pattern layer (upper heater base) and the heat sink base (fluid passage; Figure 3). Logan also does not teach the ceramic heater system wherein the heater has a high-melting-point metal. Logan also does not teach a glassy boron nitride layer coated over Logan’s graphite heater (134, column 3, lines 34-36) embedded in Logan’s pyrolytic boron nitride (130, column 3, lines 32-

Art Unit: 1763

35). Logan does not teach that the upper heater base and lower heater base are coupled together by a ceramic adhesive, however Logan does teach that the heat sink base (140) and the support (152) are coupled together by a ceramic adhesive (column 4, lines 28-45).

Gilchrist, Robin et al teaches a heater/cooling chuck base (15; Figure 3,4; column 3, lines 1-8) that is monolithically formed (see constant cross-hatching; Figures 3, 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to extend the height of Logan's temperature controlling chambers 150 such that a fluid passage is provided in the lower surface of the upper heater base, and for Logan to manufacture a monolithic heat sink base (140), as taught by Gilchrist, and pattern layer (124) of boron nitride or other ceramics (column 3, lines 13-15) and for Logan to replace his pyrolytic graphite material with a high-melting point metal material including fabricating Logan's substrate layer of boron nitride with a coating of glassy boron nitride there over and bonding additional components of his ceramic heater with his ceramic adhesive.

Motivation to extend the height of Logan's temperature controlling chambers 150 such that a fluid passage is provided in the lower surface of the upper heater base is to further control heat transfer between Logan's ceramic heater layers as taught by Logan (column 2, lines 10-15), further motivation for Logan to manufacture a monolithic heat sink base (140), as taught by Gilchrist is to eliminate a required "seal ring" as taught by Logan (column 4, lines 28-49). Additionally, it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art. (Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Rose, 220 F.2d 459, 105

Art Unit: 1763

USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); See MPEP 2144.04).

Motivation for Logan to manufacture his heat sink base (140) and pattern layer (124) of boron nitride or other ceramics (column 3, lines 13-15) and for Logan to replace his pyrolitic graphite material with a high-melting point metal material including fabricating Logan's substrate layer 45 of boron nitride with a coating of glassy boron nitride there over is to provide for alternate and equivalent material of construction and bonding including providing thermal expansion matching (column 4, lines 14-16).

4. Claims 2, 4-6, 11, 13, 17, 19, 28, 30, 32, and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652) and Gilchrist, Robin et al (US 5,846,375 A) in view of Manabu Edamura (JP407337630A)². Logan and Gilchrist are discussed above. Logan further teaches - 5. The ceramic heater wherein the fluid which flows in the fluid passage is at least one gas selected from Ar, He, Ne and N₂ gases or a mixed gas thereof (column 4, lines 1-13). Logan also teaches - 11. The ceramic heater system according to claim 9, wherein the heater has glassy boron nitride (column 3, lines 32-40) coated on an outer surface of graphite of which the heater is formed (column 3, line 38). 5. - The ceramic heater wherein the fluid which flows in the fluid passage is at least one gas selected from Ar, He, Ne and N₂ gases or a mixed gas thereof (column 4, lines 5-10).

Logan and Gilchrist do not teach:

² Machine Translation from <http://www1.ipdl.jpo.go.jp/PA1/cgi-bin/PA1DETAIL>

Art Unit: 1763

2. The ceramic heater system according to claim 1, wherein the fluid passage has a plurality of concentric circular passage portions and a plurality of penetration passage portions connecting the circular portions passage, and any adjacent two of the penetration passage portions are not aligned in a radial direction

4. The ceramic heater system, wherein the fluid passage has a fluid inlet formed in a central portion of a lower surface of the heater base and fluid outlets formed in outer circumference portions of the lower surface of the heater base.

6. Argon gas as a the heat transfer gas

11. a glassy boron nitride layer coated over Logan's graphite heater (134, column 3, lines 34-36) embedded in pyrolytic boron nitride (column 3, lines 32-35)

17. The ceramic heater system according to claim 1, wherein the fluid passage has a fluid inlet formed in a central portion of a lower surface of the heater base and a plurality of fluid outlets formed through circumferential side walls of the heater base.

19. a chamber whose interior can be kept in a vacuum state by and exhaust system and a heater base that is integrally formed of a ceramic material because Logan only teaches ceramic materials (boron nitride) for the heater base components of 122, 130 as discussed above. Logan teaches base 140 made from KOVAR and does not teach a specific material for component 124.

Manabu Edamura teaches a similarly cooled electrostatic chuck arrangement (Figures 1, 2, 7; abstract) including an electrostatic chuck (3, abstract): a fluid passage (7, abstract; Figure 7) provided in the chuck base whereby the base is cooled by letting a fluid (helium and argon; abstract) to flow in the fluid passage further including:

Art Unit: 1763

2. An electrostatic chuck wherein the fluid passage has a plurality of concentric circular passage portions (7, abstract; Figure 7) and a plurality of penetration passage portions (3, abstract; Figure 7) connecting the circular portions passage – see Figure 7 and compare with Applicant's Figure 2.

4. fluid passages (7, Figure 1, 2, 7) with a fluid inlet (6, Figure 1,2) formed in a central portion of a lower surface of the heater base and fluid outlets (7, Figure 1,2) formed in outer circumference portions of the lower surface of the base.

5,6. The ceramic heater wherein the fluid which flows in the fluid passage is at least one gas selected from Ar and He (abstract).

17. fluid passages with a fluid inlet (6, Figure 2) formed in a central portion (6, Figure 2) of a lower surface of the heater base and a plurality of fluid outlets formed through circumferential side walls of the heater base – Figure 3 shows the pressure distribution across the back surface of the wafer. The pressure is shown at 10Torr at the center ([Example]) and drops to 5mTorr (the chamber pressure, [Example]). As a result of the pressure gradient from the center to the edge of the back surface, a flow of coolant is established.

19. a chamber (1) whose interior can be kept in a vacuum state (5mTorr [Example]) by and exhaust system (2) and a heater base (3)

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Logan and Gilchrist to replace the heat sink base with Manabu Edamura's heat sink base made of ceramic material, and for Logan and Gilchrist to replace his pyrolitic graphite material

Art Unit: 1763

with a high-melting point metal material including fabricating Logan's substrate layer of boron nitride with a coating of glassy boron nitride there over.

Motivation for Logan and Gilchrist to replace the heat sink base with Manabu Edamura's heat sink base made of ceramic material is to provide for uniform heating or cooling of the semiconductor wafer as taught by Manabu Edamura (abstract).

Motivation for Logan and Gilchrist to replace the pyrolytic graphite material with a high-melting point metal material including fabricating Logan's substrate layer of boron nitride with a coating of glassy boron nitride there over is to provide alternate and equivalent material of construction.

5. Claims 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A), and Manabu Edamura (JP407337630A) in view of Ameen et al (USPat. 6,143,128). All of Logan, Gilchrist, and Manabu Edamura are discussed above. Logan further teaches, in a separate embodiment (Figure 1), a lower electrode (50; column 3, lines 1-5) in the heater base (40, Figure 1; column 3, lines 32-53) and located between an upper surface (42) of the heater base and a heater (60). However, Logan, Gilchrist, and Manabu Edamura do not teach a showerhead fed by a process-gas supply mechanism. Manabu Edamura and Logan each do not teach an RF powered showerhead that is electrically isolated. Ameen teaches a similar plasma processing apparatus (Figure 1; column 5, line 66 – column 6, line 30) including a showerhead (61) fed by a process-gas supply mechanism (11). Ameen teaches an RF powered showerhead that is electrically isolated (column 7, lines 9-26, 33-44). Ameen further teaches an etching gas (21, 22, 29; Figure 1).

Art Unit: 1763

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Ameen's electrically isolated RF powered showerhead and process-gas supply mechanism to Manabu Edamura's processing apparatus including adding a lower electrode to Manabu Edamura's second embodiment (Figure 3).

Motivation to add Ameen's electrically isolated RF powered showerhead and process-gas supply mechanism to Manabu Edamura's processing apparatus including adding a lower electrode to Manabu Edamura's second embodiment (Figure 3) is to evenly distribute the process gases over the substrate and to provide additional heating.

6. Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652) and Gilchrist, Robin et al (US 5,846,375 A) in view of Fuji et al (USPat. 6,135,052). Logan and Gilchrist are discussed above. Logan and Gilchrist do not teach means for temperature adjustment of the fluid coolant from a heat exchanger when controlling wafer temperature. Fuji et al teaches equivalent wafer temperature control means including a temperature controller (12, Figure 1) for a predetermined temperature of a fluid coolant by a heat exchanger (item 4, Figure 1; claim 1; column 2, lines 47-52), configured to either remove or add heat, thereby imparting temperature control of a wafer. Fuji et al also teaches a showerhead with associated process gas supply (column 3, lines 60-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Logan and Gilchrist's coolant fluid sources with Fuji's coolant fluid sources including wafer temperature control means for temperature adjustment of the fluid coolant.

Motivation to replace Logan and Gilchrist's coolant fluid sources with Fuji's coolant fluid sources including wafer temperature control means for temperature adjustment of the fluid

Art Unit: 1763

coolant is to provide for wafer temperature control during processing as taught by Fuji (column 2, lines 39-46).

7. Claims 26, 27, 51, 53, 62, and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652) and Gilchrist, Robin et al (US 5,846,375 A) in view of Steger et al (USPat. 5,788,799). Logan and Gilchrist are discussed above. Logan further teaches an oxide-based metallic material ("alumina"; column 3, line 15 – Al_2O_3). However, Logan and Gilchrist do not teach aluminum nitride (AlN) as an alternate ceramic material. Steger teaches ceramic liner materials (claim 6) for plasma facing chamber components (column 7, lines 41-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Logan and Gilchrist to replace his boron nitride component materials with aluminum nitride as taught by Steger.

Motivation for Logan and Gilchrist to replace his boron nitride component materials with aluminum nitride as taught by Steger is to provide alternate and equivalent materials of construction as taught by Steger (claims 2, 6, and 10).

8. Claims 41, 42, 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652) and Gilchrist, Robin et al (US 5,846,375 A) in view of Whitaker et al (USPat. 4,622,687). Logan and Gilchrist are discussed above. However, Logan and Gilchrist do not teach his fluid passage having an increased surface area thereby providing an improved heat transfer (heating/cooling efficiency). Whitaker teaches a heat transfer fluid conduit (43, Figure 2, 2A) with an increased surface area (surface roughness; column 18, line 68 – column 19, line 2) thereby providing an improved heat transfer (heating/cooling efficiency).

Art Unit: 1763

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Logan and Gilchrist to roughen the internal surface area of the fluid conduit as taught by Whitaker.

Motivation for Logan and Gilchrist to roughen the internal surface area of the fluid conduit is to provide an improved heat transfer as taught by Whitaker (column 18, line 68 – column 19, line 2).

9. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A), and Steger et al (USPat. 5,788,799) in view of Manabu Edamura (JP407337630A). Logan, Gilchrist, and Steger are discussed above. Logan, Gilchrist, and Steger do not teach the fluid passage has a fluid inlet formed in a central portion of a lower surface of the heater base and fluid outlets formed in outer circumference portions of the lower surface of the heater base.

Manabu Edamura teaches a similarly cooled electrostatic chuck arrangement (Figures 1, 2, 7; abstract) including an electrostatic chuck (3, abstract): a fluid passage (7, abstract; Figure 7) provided in the chuck base whereby the base is cooled by letting a fluid (helium and argon; abstract) to flow in the fluid passage further including fluid passages (7, Figure 1, 2, 7) with a fluid inlet (6, Figure 1,2) formed in a central portion of a lower surface of the heater base and fluid outlets (7, Figure 1,2) formed in outer circumference portions of the lower surface of the base.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Logan, Gilchrist, and Steger to replace the heat sink base with Manabu Edamura's heat sink base including fluid passages a fluid inlet formed in a central portion of a lower surface of the

Art Unit: 1763

heater base and fluid outlets formed in outer circumference portions of the lower surface of the base.

Motivation for Logan, Gilchrist, and Steger to replace his heat sink base with Manabu Edamura's heat sink base is to impart a desired temperature distribution as taught by Manabu Edamura (Problems to be solved by the invention – see translation).

10. Claim 54, 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A), and Steger et al (USPat. 5,788,799) in view of Whitaker et al (USPat. 4,622,687). Logan, Gilchrist, and Steger are discussed above. However, Logan, Gilchrist, and Steger do not teach a fluid passage having an increased surface area thereby providing an improved heat transfer (heating/cooling efficiency). Whitaker teaches a heat transfer fluid conduit (43, Figure 2, 2A) with an increased surface area (surface roughness; column 18, line 68 – column 19, line 2) thereby providing an improved heat transfer (heating/cooling efficiency).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to roughen the internal surface area of Logan, Gilchrist, and Steger's fluid conduit as taught by Whitaker.

Motivation to roughen the internal surface area of Logan, Gilchrist, and Steger's fluid conduit as taught by Whitaker is to provide an improved heat transfer as taught by Whitaker (column 18, line 68 – column 19, line 2).

11. Claims 9, 56, 58, 61, and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), and Gilchrist, Robin et al (US 5,846,375 A) in view of Arai et al (JP07272837 A). Logan and Gilchrist are discussed above. Logan and Gilchrist do not teach

Art Unit: 1763

heater formed in a coil form. Arai teaches a similar ceramic heater (Title; Figures 1,2) including a heater (2; Figure 1a) formed in a coil form.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to shape Logan and Gilchrist's heater in a coil form as taught by Arai.

Motivation to shape Logan and Gilchrist's heater in a coil form as taught by Arai is to provide uniform temperature distribution (Constitution).

12. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A), Arai et al (JP07272837 A) in view of Manabu Edamura (JP407337630A). Logan, Gilchrist, and Arai are discussed above. Logan, Gilchrist, and Arai do not teach the fluid passage has a fluid inlet formed in a central portion of a lower surface of the heater base and fluid outlets formed in outer circumference portions of the lower surface of the heater base.

Manabu Edamura teaches a similarly cooled electrostatic chuck arrangement (Figures 1, 2, 7; abstract) including an electrostatic chuck (3, abstract): a fluid passage (7, abstract; Figure 7) provided in the chuck base whereby the base is cooled by letting a fluid (helium and argon; abstract) to flow in the fluid passage further including fluid passages (7, Figure 1, 2, 7) with a fluid inlet (6, Figure 1,2) formed in a central portion of a lower surface of the heater base and fluid outlets (7, Figure 1,2) formed in outer circumference portions of the lower surface of the base.

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Logan, Gilchrist, and Arai to replace the heat sink base with Manabu Edamura's heat sink base including fluid passages a fluid inlet formed in a central portion of a lower surface of the

Art Unit: 1763

heater base and fluid outlets formed in outer circumference portions of the lower surface of the base.

Motivation for Logan, Gilchrist, and Arai to replace the heat sink base with Manabu Edamura's heat sink base is to impart a desired temperature distribution as taught by Manabu Edamura (Problems to be solved by the invention – see translation).

13. Claim 59 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A), and Arai et al (JP07272837 A) in view of Whitaker et al (USPat. 4,622,687). Logan, Gilchrist, and Arai are discussed above. However, Logan, Gilchrist, and Arai do not teach his fluid passage having an increased surface area thereby providing an improved heat transfer (heating/cooling efficiency). Whitaker teaches a heat transfer fluid conduit (43, Figure 2, 2A) with an increased surface area (surface roughness; column 18, line 68 – column 19, line 2) thereby providing an improved heat transfer (heating/cooling efficiency).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to roughen the internal surface area of Logan, Gilchrist, and Arai's fluid conduit as taught by Whitaker.

Motivation to roughen the internal surface area of Logan, Gilchrist, and Arai's fluid conduit as taught by Whitaker is to provide an improved heat transfer as taught by Whitaker (column 18, line 68 – column 19, line 2).

14. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A), and Arai et al (JP07272837 A) in view of Whitaker et al (USPat. 4,622,687). Logan, Gilchrist, and Arai are discussed above.

Art Unit: 1763

However, Logan, Gilchrist, and Arai do not teach his fluid passage having an increased surface area thereby providing an improved heat transfer (heating/cooling efficiency). Whitaker teaches a heat transfer fluid conduit (43, Figure 2, 2A) with an increased surface area (surface roughness; column 18, line 68 – column 19, line 2) thereby providing an improved heat transfer (heating/cooling efficiency).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to roughen the internal surface area of Logan, Gilchrist, and Arai's fluid conduit as taught by Whitaker.

Motivation to roughen the internal surface area of Logan, Gilchrist, and Arai's fluid conduit as taught by Whitaker is to provide an improved heat transfer as taught by Whitaker (column 18, line 68 – column 19, line 2).

15. Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A) and Arai et al (JP07272837 A) in view of Beaudoin et al (USPat. 3,911,386). Logan, Gilchrist, and Arai are discussed above. Logan, Gilchrist, and Arai do not teach the material for a high-melting point metal electrode is one of tungsten (W), molybdenum (Mo), and platinum (Pt). Beaudoin teaches the material for a high-melting point metal electrode (14; Figure 1) is made from platinum (abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture Logan, Gilchrist, and Arai's metal electrode from platinum as taught by Beaudoin.

Art Unit: 1763

Motivation to manufacture Logan, Gilchrist, and Arai's metal electrode from platinum as taught by Beaudoin is to operate Logan and Arai's metal electrode at elevated temperatures as taught by Beaudoin (column 2, lines 26-30).

16. Claim 76 is rejected under 35 U.S.C. 103(a) as being unpatentable over Logan et al (USPat. 5,155,652), Gilchrist, Robin et al (US 5,846,375 A) in view of Beaudoin et al (USPat. 3,911,386). Logan and Gilchrist are discussed above. Logan and Gilchrist does not teach the material for a high-melting point metal electrode is one of tungsten (W), molybdenum (Mo), and platinum (Pt). Beaudoin teaches the material for a high-melting point metal electrode (14; Figure 1) is made from platinum (abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to manufacture Logan and Gilchrist's metal electrode from platinum as taught by Beaudoin.

Motivation to manufacture Logan and Gilchrist's metal electrode from platinum as taught by Beaudoin is to operate Logan and Arai's metal electrode at elevated temperatures as taught by Beaudoin (column 2, lines 26-30).

Response to Arguments

17. Applicant's arguments filed November 28, 2003 have been fully considered but they are not persuasive.

18. Applicant's arguments are centered on Applicant's monolithic characterization of Applicant's heater base. However, as stated above, the Examiner believes there is proper

Art Unit: 1763

motivation to combine the above teachings with Gilchrist is to eliminate a required "seal ring" as taught by Logan (column 4, lines 28-49).

19. Applicant's references to Niori are agreed with by the Examiner. However, as stated above, Gilchrist's embedded heating/cooling channels (32a-d; Figure 3,4) are formed in a monolithic base according to the uniform cross-hatching in Gilchrist's Figures 3,4.

20. Applicant's arguments with respect to claims 42, 55, and 60 are moot in view of the new grounds of rejection of said claims in view of Whitaker et al (USPat. 4,622,687) who teaches a heat transfer fluid conduit (43, Figure 2, 2A) with an increased surface area (surface roughness; column 18, line 68 – column 19, line 2) thereby providing an improved heat transfer (heating/cooling efficiency).

Conclusion

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after fax phone number for the 1763 art unit is (703) 872-9306. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

